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Current Support Brief

PROSPECTS FOR THE USE OF COMMUNICATIONS SATELLITES BY THE USSR

CIA/RR CB 64-11

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PROSPECTS FOR THE USE OF COMMUNICATIONS SATELLITES BY THE USSR

Economic considerations provide little justification for the independent development and operation by the USSR of a communications satellite system. The major economic attractiveness of such a system is its prospective application on transoceanic routes of high traffic density -- an application for which Soviet requirements are minimal. On overland routes, Soviet communications needs can be met more effectively by conventional communications systems such as microwave radio relay, tropospheric scatter, and cable systems that are appreciably less expensive than satellite systems. Although it is unlikely, for the foregoing reason, that the USSR will elect to establish an independent satellite system, the possibility that such a course of action might be undertaken for political purposes cannot be ignored. From an economic point of view, however, a more attractive alternative would be cooperation in some form of Western-sponsored regional or global satellite system. A joint venture with Western nations would enable the USSR to apply the scientific, engineering, and manufacturing resources that would be required for the development of an independent system to other priority programs. At the moment, Soviet intentions are not clear, but there is evidence that suggests an interest in cooperation with the West.

1. System Types

Of the two general types of communications satellite systems -- active and passive -- active systems hold the most promise for the commercial transmission of telephone, telegraph, data, and television. As distinguished from passive systems, which only reflect radio signals, active systems are designed around satellite repeaters that receive, amplify, and retransmit radio signals between terminal stations on the earth. Such systems can afford global or regional communications coverage with satellites placed either in random or in phased orbits at low and intermediate altitudes of from a nominal 150 to 12,000 statute miles or with satellites in a synchronous, equatorial orbit at 22,300 statute miles. *

* Random orbit satellites derive their name from the fact that they are not precisely placed into orbit, and, consequently, there is relative motion of a random value between satellites. Satellites in a phased orbit (also called subsynchronous orbit) [footnote continued on p. 2.]

Conceptually, a synchronous orbit system could provide continuous global coverage with three active repeaters spaced at approximate intervals of 120 degrees, whereas a random orbit system at intermediate altitudes could provide near continuous global coverage with from 20 to 40 satellites. An 8-hour phased orbit system offers a third possibility whereby 10 to 12 satellites at an intermediate altitude of about 8,700 statute miles could provide continuous global coverage between latitudes 60 degrees north and 60 degrees south.

2. Economic Considerations

Although available estimates of the cost of communications satellite systems are extremely tenuous and differ widely -- depending on a wide range of assumptions as to system configurations, ground station designs, probability of launch success, and satellite life expectancy -- it has become increasingly clear that satellite systems will not be competitive with conventional overland communications systems. In comparison with conventional overland systems such as microwave radio relay, tropospheric scatter, and cable, operational satellite systems would entail significantly higher initial investment costs and higher average costs per communications channel. Communications satellites enjoy a more favorable cost relationship, however, with respect to transoceanic cable systems because of the higher cost of submarine coaxial cables relative to that of conventional overland communications systems. In fact, it is anticipated that satellite systems that can provide high-capacity service on dense transoceanic communications routes will be competitive with coaxial submarine cables (the only relevant high-quality and high-capacity transoceanic communications system) in terms of average cost per communications channel.

In addition to limiting deployment, economic factors also will influence the types of communications service to be carried by satellites. Even on high-capacity transoceanic routes, optimum use of available capacity will dictate emphasis on telephone, telegraph, and data services. The capability to provide television service can be and probably will be available on communications satellites. The use of this capability, however, probably will be limited to special events, as one

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have orbital time periods that are an integral fraction of 24 hours -- for example, 6, 8, or 12 hours. Synchronous satellites, moving from west to east in an equatorial orbit at 22,300 miles, have an orbital time period equal to that of the earth's rotation (24 hours) and appear stationary relative to any point on earth.

television channel requires the equivalent of 600 telephone channels or more than 10,000 telegraph channels.* In addition to practical considerations of time zone and language differences that normally would inhibit the exchange of live television over great distances, television programs can be taped or filmed and shipped by air at a cost that would be nominal compared with satellite service.

3. Prospects

Communications requirements that act as a stimulus to the development of a communications satellite system are far stronger in the Western world than in the USSR. Given the present and projected state of technology, rational economic considerations virtually limit the use of communications satellite systems to high-density transoceanic communications routes. In this respect the requirements of the West are far more pressing, inasmuch as the volume of Free World transoceanic communications traffic has been rising at a rate that cannot be met economically or qualitatively by conventional communications systems. The tabulation below shows estimates, in terms of telephone channel equivalents, of US-European trans-Atlantic communications capacity for May 1963 and requirements for 1968 and 1975**:

Areas	May 1963	1968 (Estimated)	1975 (Estimated)
US - Western Europe	280	640	1,560
US - Soviet Bloc	4	27	81
US-USSR	2	14	55
US - European Satellites	2	13	26
Total	280	670	1,640

Although Soviet transoceanic communications requirements are growing through increased economic and political contact with non-Bloc countries, present and projected traffic densities would provide little economic justification for the establishment of a communications satellite system.

* One telephone channel can be used to provide 18 or more telegraph channels.

** Data have been rounded to three significant digits or less, depending on their assigned validity, and are based on the US contribution to the CCITT/CCIR Plan Committee.

Moreover, most of the high-density traffic requirements of the USSR are with contiguous European Bloc countries, and internal Soviet and intra-Bloc facilities planned for completion by the end of 1965 will have sufficient capacity and potential for expansion to satisfy these requirements at least through 1975. Based purely on economic considerations, therefore, there is little justification for the USSR to establish an independent communications satellite system.

The major alternative of the USSR to establishing an independent communications satellite system is cooperation with Western countries in worldwide or regional systems. The Soviet desire to project an image abroad as a leader in space technology or other political considerations might militate against such a decision even though cooperation with the West could be highly advantageous. Soviet participation in a Western-sponsored system would require the expenditure of only a fraction of the money required for the establishment of an independent system -- an important consideration for an economy that is experiencing difficulties in the allocation of its resources -- and service costs would be more realistically related to service requirements. Furthermore, the illusion of leadership in space technology would not necessarily be diminished seriously in a cooperative venture that could be touted as a demonstration of peaceful cooperation in space.

Soviet intentions are not clear, but there has been some evidence that suggests an interest in cooperation with the West. The first such indication was the Blagonravov-Dryden agreement concluded in 1962 between the USSR and the US that provided for collaboration in the experimental testing of a passive communications satellite (Echo II). More recently, in November 1963, the USSR at the Extraordinary Administrative Radio Conference of the International Telecommunication Union agreed to the allocation of a total of 2,800 megacycles of the radio frequency spectrum for communications satellites. This action was in sharp contrast to its earlier allocation proposals that had been interpreted as an attempt to frustrate US ambitions for a global communications satellite system.

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Analysts: [redacted]

Coord:

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